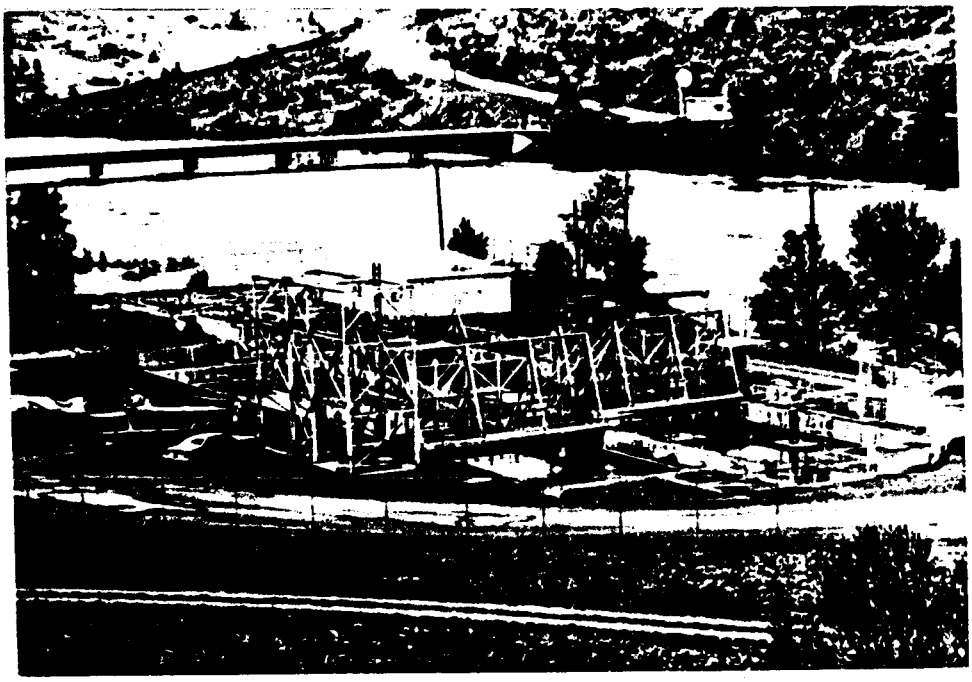
# OXBOW FISH HATCHERY

**1990 Steelhead Brood Year**
**1989 Spring Chinook Brood Year**



**by**

**Brent R. Snider, Fish Hatchery Superintendent I**

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**OXBOW FISH HATCHERY**

# 1990 STEELHEAD BROOD YEAR AND 1989 CHINOOK SALMON BROOD YEAR REPORT

## ABSTRACT

A total of 2,728 adult steelhead trout Oncorhynchus mykiss were trapped at the Hells Canyon Dam trap for the 1990 brood year. In the fall of 1989, 2,222 steelhead trout were trapped, and 506 steelhead trout were trapped in the spring of 1990. A total of 1,051 adult steelhead trout were outplanted for sport fishing opportunities above Hells Canyon Dam. Female steelhead trout totaling 565 were spawned producing a total of 2,359,950 green eggs. Survival to eye-up was only 5.0% for a total of 114,500 eyed eggs which were sent to Niagara Springs Hatchery. The remaining 95.0% of the egg-take perished due to water quality problems.

Spring chinook salmon Oncorhynchus tshawytscha trapping resulted in the trapping of 84 adult fish and 3 jacks. These were all transferred to Rapid River Hatchery for spawning.

A fall chinook salmon Oncorhynchus tshawytscha program was set up to determine the feasibility of raising fall chinook salmon under the current rearing conditions at Oxbow Hatchery. The fish reached a final weight of 198 per pound which fell short of the goal of rearing the fish to 100 per pound.

Authors

Brent R. Snider
Fish Hatchery Superintendent I

## INTRODUCTION

Oxbow Fish Hatchery is part of the Idaho Power Company's (IPC) hatchery system and has been in operation since 1962. The Oxbow facility is owned and funded by Idaho Power Company and operated by the Idaho Department of Fish and Game (IDFG). The hatchery is located on the Oregon shore of the Snake River at mile marker 270, approximately 1/4-mile below IPC's Oxbow Hydroelectric Plant (602 river miles from the Pacific Ocean). Oxbow Hatchery is a steelhead trout Oncorhynchus mykiss and spring chinook salmon Oncorhynchus tshawytscha adult holding and egg-taking station.

## OBJECTIVES

The primary purpose of Oxbow Hatchery is to trap enough returning adult steelhead trout and spring chinook salmon to meet the Hells Canyon mitigation requirements for adult anadromous fish returns on the Upper Snake River. The mitigation goal is to produce 1.3 million eyed steelhead trout eggs for rearing at Niagara Springs Fish Hatchery. Also, all returning adult spring chinook salmon are trapped and then transferred to Rapid River Fish Hatchery for spawning.

## Facility Description

Oxbow Hatchery consists of a main hatchery building, four adult holding ponds, an off-station fish trap, and a single-family residence. The facility has six cinderblock raceways that have exceeded their usefulness.

The hatchery building is a 28 ft x 60 ft single-story metal structure partitioned into two main rooms. Half of the building consists of shop space, office space, and sleeping quarters, while the other half is for egg incubation. Two 8-ft square sheds attached to the main building provide storage.

The incubation room has the capacity to eye-up 2 million eggs. The 28 incubation stacks provide the hatchery with 224 incubation trays (FAL and Heath trays).

Adult holding and production facilities include four holding ponds, a fish trap, and a fish transport truck. The four holding ponds are actually two large ponds separated into four. The two larger divisions each measure 105 ft x 30 ft x 5 ft providing 31,500 cubic feet of holding area. The two smaller divisions measure 55 ft x 30 ft x 5 ft providing 16,500 cubic feet of holding space. Two electric crowding racks provide the ability to consolidate the fish for handling. The production facilities consist of two recently repaired raceways that provide 3,400 cubic feet of rearing space. Four additional raceways could provide an additional 6,800 cubic feet of rearing space after reparations. The adult fish trap consists of an attraction pool, fish ladder, two weirs, a fish trap, and a loading hopper. The fish are removed from the trap when the loading hopper is hoisted the 80 feet to the fish transport truck. The fish truck is a 1981 GMC 2.5-ton 10-wheeled truck with a bed-mounted 1,000-gallon fish tank. Up to 100 fish are then transported the 23 miles to Oxbow Hatchery.

## Water Supply

The Snake River provides the water for hatchery operations. A pumping platform adjacent to the hatchery holds four production pumps. Two production pumps (100 hp each) produce 20 cubic feet per second (cfs) of water and two incubation pumps (5 hp each) produce another 0.5 cfs of water. Only one 100-horsepower pump and one 5-horsepower pump operate at any given time. The other two act as auxiliary pumps and have a separate power source. Water temperatures range from a winter low of 33°F to a late summer high of 77°F (Figure 1). Water from the production pumps passes through two aeration pump platforms before entering the four holding ponds. Incubation water enters an elevated surge tank in the hatchery building before distribution through a 4-inch PVC water line to the 14 incubator stacks.

## Staffinq

Oxbow Hatchery is staffed by one permanent Hatchery Superintendent I. Two temporary Bio-aide positions share the 1,240 hours budgeted for extra help.

# 1990 BROOD YEAR STEELHEAD

## Fish Production

Fall steelhead trout trapping began on October 20, 1989 and ended on December 2, 1989 capturing 2,222 steelhead (Figure 2). Trapping occurred five days a week. No trapping occurred on the weekends to enhance the sport fishing below Hells Canyon Dam. Trap operation hours was 492 in the fall for a trapping efficiency of 4.5 fish per trap operation hour.

Spring trapping started on March 5, 1990 and ended on March 30, 1990. Total trap operation hours were 408, and a total of 506 adult steelhead trout were trapped (Figure 2). Total fish per trap operation hours in the spring was 1.2 fish per trap operation hour.

Total fish trapped for the 1990 brood year was 2,728 adult steelhead trout. Total adult male steelhead trapped was 1,100 (40.3%) and total adult females trapped was 1,628 (59.6%). A total of 1,051 adult steelhead were outplanted for sport fishing opportunities above Hells Canyon Dam. The Boise River received 501, the Payette River received 350, and the Snake River below Oxbow Dam received 400 adult steelhead.

The adults returning to the Hells Canyon Trap in 1989 and 1990 were from smolt releases in 1987 and 1988. A total of 1,281,400 smolts were released in 1987 (404,000 fall release and 877,400 spring release). A total of 735,500 smolts were released in the spring of 1988.

A total of 853 steelhead trout were measured for length in 1990; 590 females and 263 males (Figure 3). The one-ocean contingent was 474 adult steelhead trout (292 females; 182 males), and the two-ocean contingent was 379 adult steelhead trout (298 females; 81 males). Criteria used to separate year class was males less than 68 cm and females 65 cm and less are one-ocean.

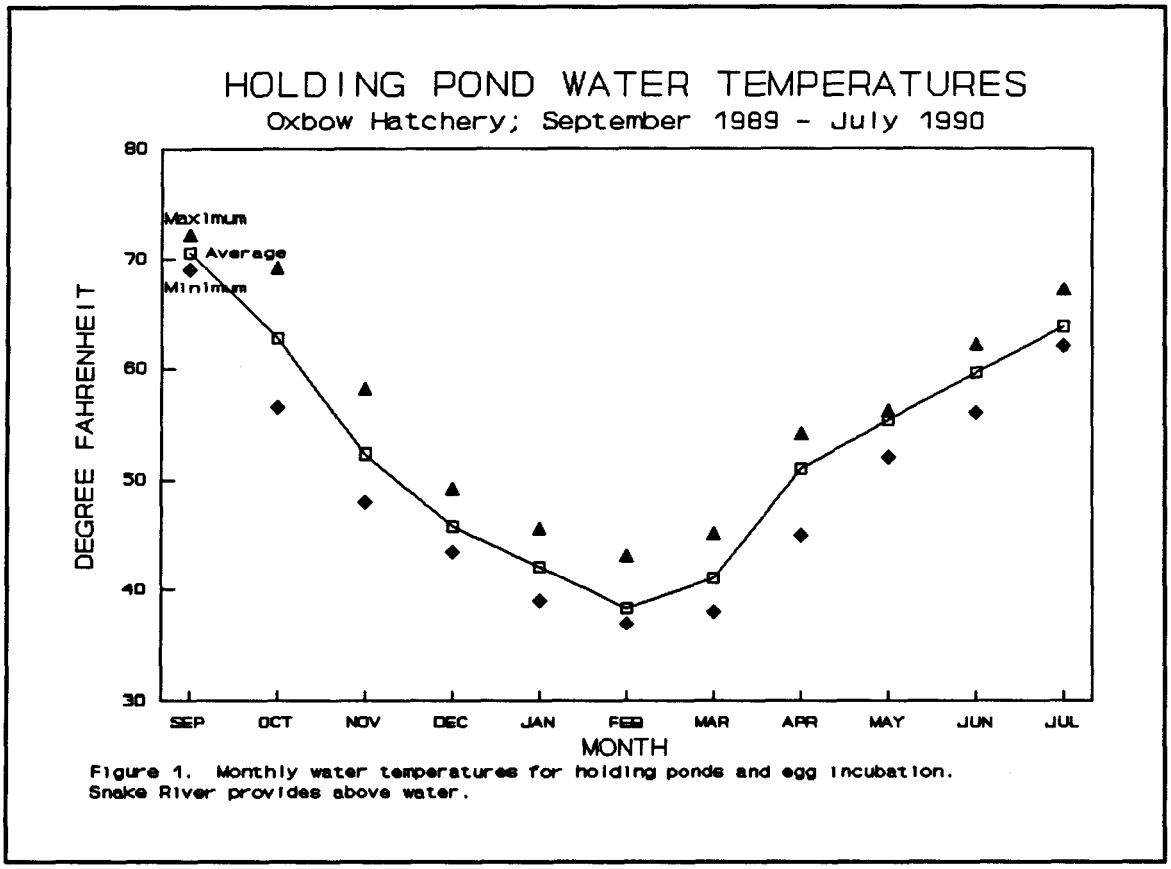



Figure 1. Monthly water temperatures for holding ponds and egg incubation. Snake River provides above water.

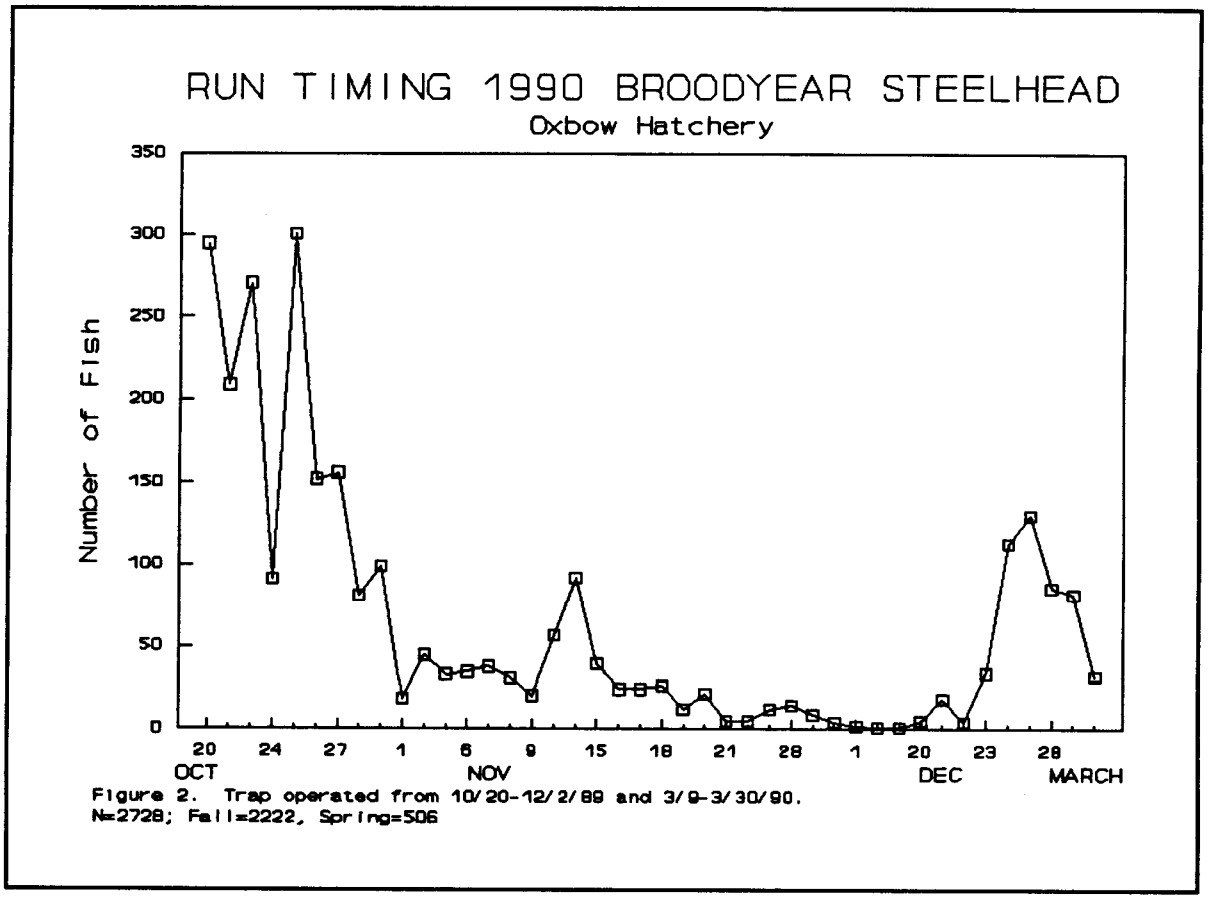


Figure 2. Trap operated from 10/20-12/2/89 and 3/9-3/30/90.
N=2728; Fall=2222, Spring=506

## Tag Recovery

Two fish were recovered with jaw tags this trapping year. These tags were from the National Marine Fisheries Service tagging station at Lower Granite Dam. One Oregon Department of Fish and Wildlife spaghetti tag was recovered. The snouts were removed from 28 adult steelhead with left-ventral (LV) fin clips and shipped to the tag recovery laboratory in Lewiston.

Adult fish were empirically examined to determine "wild" from hatchery fish. The presence and condition of all fins was used to determine the difference, with wild fish having perfect or nearly perfect fins, and those fish with any missing fins or eroded or deformed fin rays were seen as fish with hatchery origins. A total of three fish trapped were interpreted as meeting this definition of "wild" (0.11% of 2,728).

## Holding and Spawning

Ponded steelhead trout were given no chemical treatments during the 1989-90 holding season.

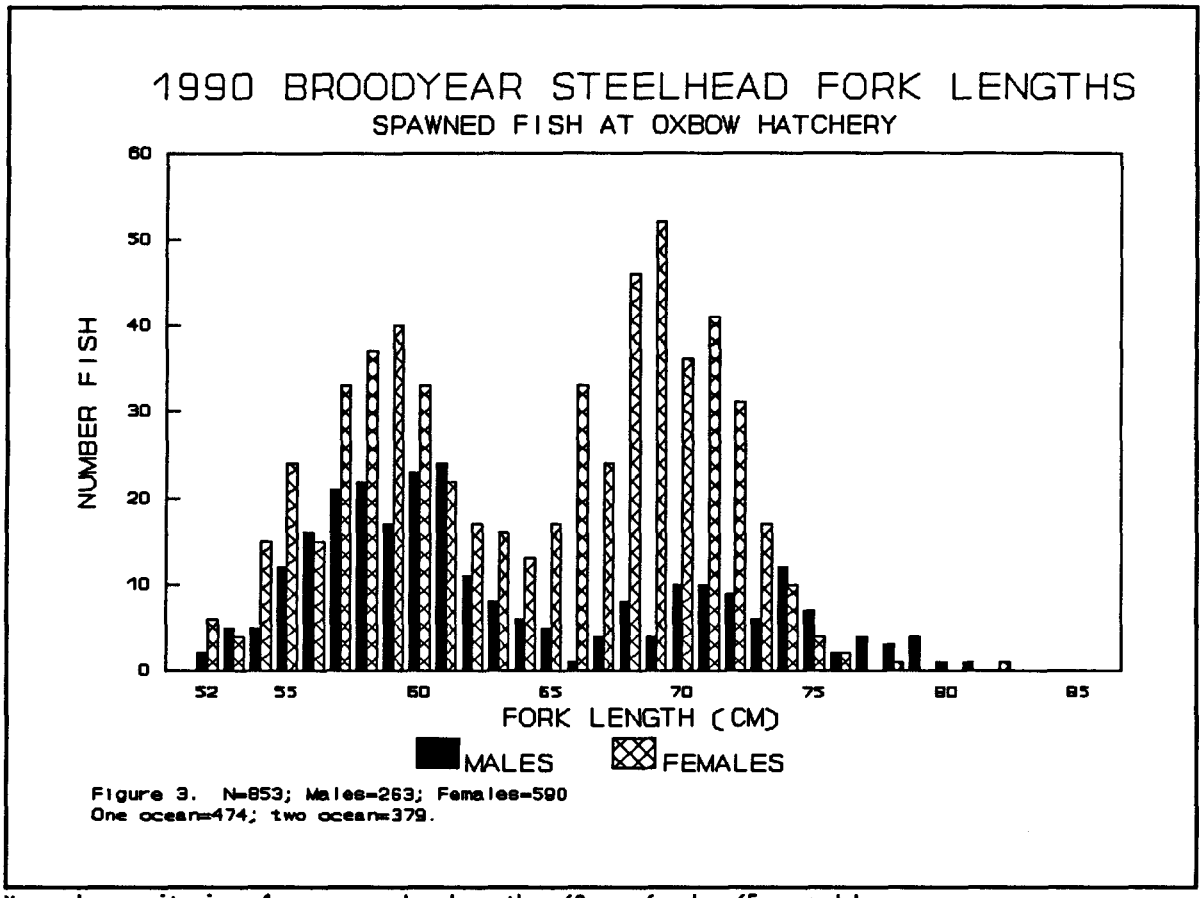
## Prespawning Mortality

Prespawning mortality totaled 232 adults of the 1,677 ponded steelhead trout (14%). No fish were lost during transport from the trap to the hatchery. Mortality during the spawning season, primarily male deaths due to handling, was 359 (21.4%). These were males that may have contributed sperm more than once. At the end of the spawning season there were many prespawn female mortalities which produced a yellow fluid when checked for ripeness. These females were discarded. These fish also showed no signs of fungus or other common disease symptoms normally found at Oxbow Fish Hatchery.

## Spawning Operations

Spawning operations began on March 13 and ended on April 19, 1990. A total of 565 females were spawned for a green egg total of 2,359,950; an average of 4,177 eggs per female (Table 1). Fecundity was calculated after eyed-eggs were sorted with an electronic egg counter. Twenty-five females were killed but their eggs were not used due to apparent fish health problems.

Females were dry-spawned using the incision method. Eggs were collected in a colander to drain the ovarian fluid. Eggs from two females were placed into a spawning bucket and fertilized with sperm from two or three males. The fertilized eggs were allowed to stand in two cups of well water for two to five minutes, then rinsed once with well water. Fertilized eggs were water-hardened with 100 ppm buffered Argentyne for one hour.




Year class criteria: 1-ocean - males less than 68 cm, females 65 cm and less;
2-ocean - males 68 cm and larger, females 65 cm or larger.

Table 1. Oxbow Hatchery steelhead spawning record, 1990.

| LOT | DATE | # FEMALES | GREEN EGGS | FECUNDITY | EYED EGGS | EYE-UP |
|---|---|---|---|---|---|---|
| 1 | 3/13 | 22 | 100,000 | 4,545 | 0 | 0 |
| 2 | 3/14 | 44 | 196,350 | 4,463 | 0 | 0 |
| 3 | 3/20 | 57 | 232,925 | 4,086 | 0 | 0 |
| 4 | 3/21 | 10 | 46,200 | 4,620 | 0 | 0 |
| 5 | 3/27 | 51 | 221,375 | 4,341 | 114,500 | 51.7 |
| 6 | 3/28 | 62 | 254,100 | 4,098 | 0 | 0 |
| 7 | 4/3 | 62 | 308,000 | 4,968 | 0 | 0 |
| 8 | 4/4 | 61 | 240,240 | 3,938 | 0 | 0 |
| 9 | 4/10 | 55 | 248,710 | 4,522 | 0 | 0 |
| 10 | 4/11 | 84 | 337,260 | 4,015 | 0 | 0 |
| 11 | 4/17 | 37 | 113,190 | 3,059 | 0 | 0 |
| 12 | 4/19 | 20 | 61,600 | 3,080 | 0 | 0 |
| TOTALS | | 565 | 2,359,950 | 4,177 | 114,500 | 4.9 |

## Incubation

Eggs from each spawning bucket were placed into an incubator tray; approximately 8,000 to 10,000 eggs (1,000-1,500 mis) per tray. Incubation water flows were set at 4.8 to 5.0 gpm. Incubation water ranged from a low of 38°F to a high of 59°F. After 48 hours of incubation, eggs were treated with 1,667 ppm formalin in a 15-minute drip. Treatments were on an every-other-day regime until water temperatures reached 50°F, after which treatments were administered every day.

Eye-up occurred at 330 temperature units. Eye-up percentages for all lots was 5.0% producing 114,500 eyed eggs that were transferred to Niagara Springs Hatchery. A Jensorter brand egg-sorter and electronic counter was used to determine the total number of eyed and dead eggs.

The extremely poor eye-up of the 1990 brood year steelhead eggs was attributed to poor water quality in the incubation facility. This water (Snake River) has a very high colloidal silt content, an unacceptable pH (>8.5), high nitrates, and various other pollutants (including arsenic). The additional tray cleaning requirements due to the silt load may also have contributed to this mortality.

## Fish Health

The 1990 brood year adults were disease sampled on October 26, 1989. A total of 60 fish were sampled, and results of various tests were negative for virus, bacterial kidney diseases, Ceratomyxa shasta, and other bacteria. Disease samples were not taken on brood fish trapped in the spring of 1990.

## Carcass Disposition

All carcasses were checked for clips, tags, and signs of bacteria and other diseases by hatchery employees. All fish carcasses were taken to the Halfway Landfill for burial.

## Smolt Releases

Steelhead trout smolt releases were carried out in the spring of 1990. These smolts were from the 1989 brood year at Niagara Springs Hatchery. A total of 947,800 smolts (245,200 pounds) were released into the Snake River below Hells Canyon Dam.

# 1989 BROOD YEAR SPRING CHINOOK SALMON

## Spring Chinook Trapping

Adults returning to the Hells Canyon Trap in 1989 were from smolt releases in 1986 and 1987, and jacks returning from the 1988 release (Table 2).

Table 2. Oxbow Hatchery spring chinook returns by smolt releases, 1989.

| Release year | Number released | Adult returns by release year | Percent returns |
|---|---|---|---|
| 1986 | 140,000 | 29 | 0.02 |
| 1987 | 103,000 | 55 | 0.05 |
| 1988 | 400,600 | 3 | <0.001 |
| Totals | 643,600 | 87 | 0.013 |

Spring chinook salmon trapping began on May 23 and ended on July 10, 1989. The trap operated for 960 hours trapping 84 adults and 3 jacks (87 spring chinook salmon).

All chinook salmon were trucked to Oxbow Hatchery, anesthetized, measured for fork length, injected with erythromycin phosphate, and checked for tags and any other marks or wounds. There were no adipose-clipped fish, 1 (1.2%) jaw-tagged fish, 50 (59.5%) with gill net scars, 8 (9.6%) with nitrogen gas emboli, and 24 (27.6%) had other wounds or scars of uncertain origin.

Fork lengths of adult salmon ranged from 67 cm to 99 cm with the mean size being 78.5 cm (Figure 4). Three jacks had a mean size of Si. cm.

Four trips from Oxbow to Rapid River Hatchery were made to transport all the chinook salmon. There were no chinook mortalities this season at Oxbow. Water temperatures were reduced in the transport truck with the addition of 800 to 900 pounds of block ice per trip.

## Chinook Smolt Releases

The 1989 brood year spring chinook salmon smolts were released in the spring of 1991. These smolts were reared at Rapid River Hatchery. A total of 500,500 smolts (22,244 pounds) were released into the Snake River below Hells Canyon Dam.

## Fall Chinook Test

A fall chinook salmon program was set up to determine the feasibility of raising fall chinook salmon under the current rearing conditions at Oxbow Hatchery. The goal of rearing the fish to 100 per pound was not reached. The fish reached a final weight of 198 per pound and were destroyed at the end of the program. Table 3 shows the pertinent data for this rearing test.

Table 3. Summary of fall chinook salmon rearing test at Oxbow Fish Hatchery, 1989-1990.

| | |
|---|---|
| Eyed eggs received[a] | 51,680 |
| Total mortality | 4,368 |
| Total temperature units acquired at Oxbow | 3,365 |
| Fish per pound at swim-up | 1,010 |
| Fish per pound at test termination (June 15) | 198 |
| Pounds of food fed (#2 Bio-diet starter) | 44 |
| Pounds of food fed (#3 Bio-diet starter) | 44 |
| Pounds of food fed (1 mm Bio-diet starter) | 50 |
| Total pounds gained at termination | 198 |
| Total pound of food fed | 138 |
| Conversion | 0.7 |
| Average monthly water temperature[b] | 43.3 |
| High temperature | 58 |
| Low temperature | 38 |

[a]Eyed eggs were received from Bonneville Hatchery, Oregon Department of Fish and Wildlife.
[b]Snake River was water source.

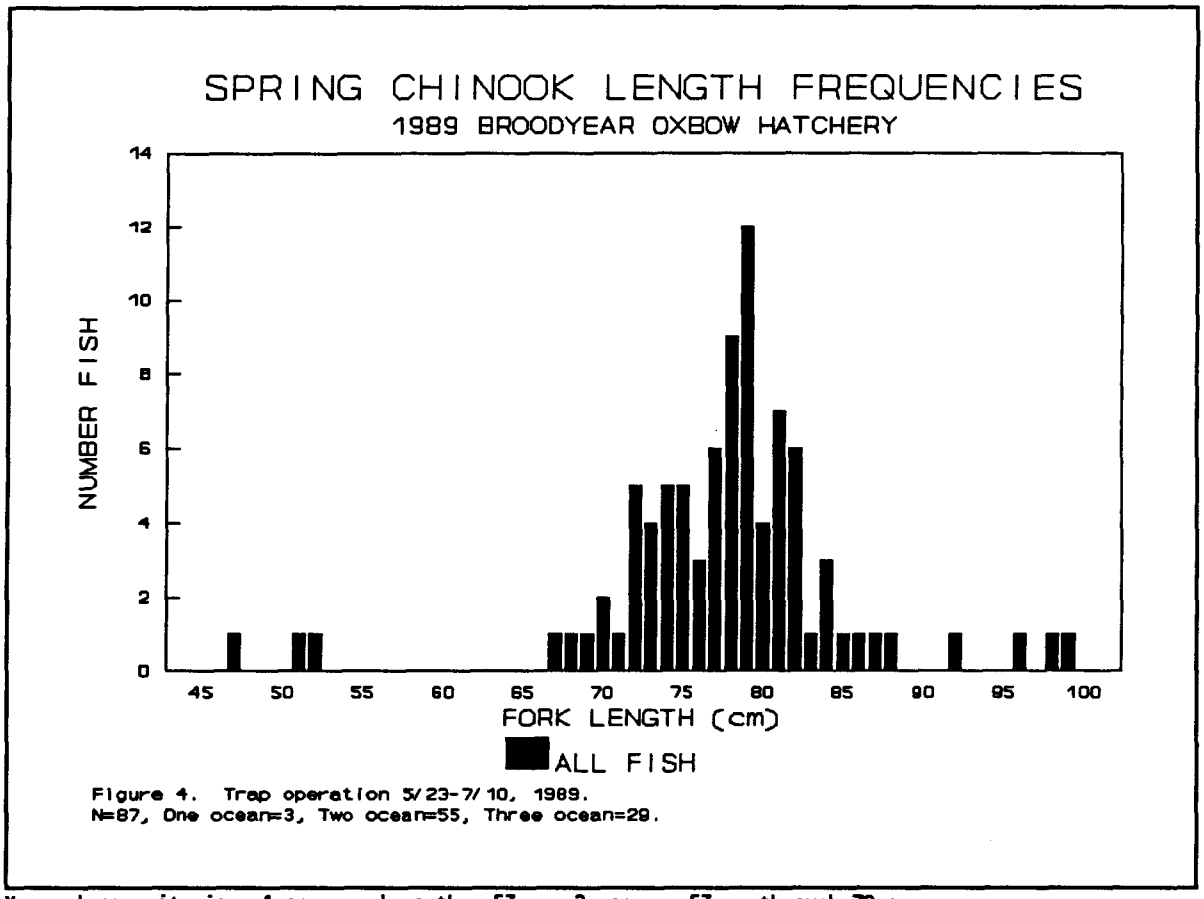



Figure 4. Trap operation 5/23-7/10, 1989.
N=87, One ocean=3, Two ocean=55, Three ocean=29.

Year class criteria: 1-ocean - less than 53 cm; 2-ocean - 53 cm through 79 cm;
3-ocean - 80 cm and larger.

# A P P E N D I C E S

Appendix A. Average monthly water temperatures in the holding ponds at Oxbow Hatchery for September 1989 through July 1990.

| Month | Average | Minimum | Maximum |
|---|---|---|---|
| SEP | 70.5 | 69 | 72 |
| OCT | 62.7 | 56.5 | 69 |
| NOV | 52.3 | 48 | 58 |
| DEC | 45.8 | 43.5 | 49 |
| JAN | 42.1 | 39 | 45.5 |
| FEB | 38.3 | 37 | 43 |
| MAR | 41.1 | 38 | 45 |
| APR | 51 | 45 | 54 |
| MAY | 55.3 | 52 | 56 |
| JUN | 59.6 | 56 | 62 |
| JUL | 63.7 | 62 | 67 |

Appendix B. Run timing of 1990 brood year steelhead. Trap operated October 20 through December 2, 1989 and March 9 through March 30, 1990.

| Date | Month | Number trapped | |
|---|---|---|---|
| 20 | OCT | 295 | |
| 21 | | 209 | |
| 23 | | 271 | |
| 24 | | 91 | |
| 25 | | 301 | |
| 26 | | 152 | |
| 27 | | 156 | |
| 30 | | 81 | |
| 31 | | 99 | |
| 1 | NOV | 18 | |
| 2 | | 45 | |
| 3 | | 33 | |
| 6 | | 35 | |
| 7 | | 38 | |
| 8 | | 31 | |
| 9 | | 20 | |
| 13 | | 57 | |
| 14 | | 92 | |
| 15 | | 40 | |
| 16 | | 24 | |
| 17 | | 24 | |
| 18 | | 26 | |
| 19 | | 12 | |
| 20 | | 21 | |
| 21 | | 5 | |
| 22 | | 5 | |
| 27 | | 12 | |
| 28 | | 14 | |
| 29 | | 9 | 2,222 Total fall trapped |
| 30 | | 4 | |
| 1 | DEC | 2 | |
| 9 | MAR | 1 | |
| 13 | | 1 | |
| 20 | | 5 | |
| 21 | | 18 | |
| 22 | | 4 | |
| 23 | | 34 | |
| 26 | | 113 | 506 Total spring trapped |
| 27 | | 130 | |
| 28 | | 86 | |
| 29 | | 82 | |
| 30 | | 32 | |
| | | | 2,728 Total 1990 brood year trapped |

Appendix C. Fork length frequencies for spawned steelhead at Oxbow Hatchery, 1990.

| Length | Male | Female | | Males | Females | Total |
|---|---|---|---|---|---|---|
| 52 | 2 | 6 | One-ocean | 182 | 292 | 474 |
| | 5 | 4 | Two-ocean | 81 | 298 | 379 |
| | 5 | 15 | | | | |
| 55 | 12 | 24 | TOTAL | 263 | 590 | 853 |
| | 16 | 15 | | | | |
| | 21 | 33 | | MEAN LENGTH | | |
| | 22 | 37 | | | | |
| | 17 | 40 | One-ocean | 58.96 | | |
| 60 | 23 | 33 | Two-ocean | 70.34 | | |
| | 24 | 22 | | | | |
| | 11 | 17 | TOTAL 64.01 | | | |
| | 8 | 16 | | | | |
| | 6 | 13 | | | | |
| 65 | 5 | 17 | | | | |
| | 1 | 33 | | | | |
| | 4 | 24 | | | | |
| | 8 | 46 | | | | |
| | 4 | 52 | | | | |
| 70 | 10 | 36 | | | | |
| | 10 | 41 | | | | |
| | 9 | 31 | | | | |
| | 6 | 17 | | | | |
| | 12 | 10 | | | | |
| 75 | 7 | 4 | | | | |
| | 2 | 2 | | | | |
| | 4 | | | | | |
| | 3 | 1 | | | | |
| | 4 | | | | | |
| 80 | 1 | | | | | |
| | 1 | | | | | |
| | 1 | | | | | |
| 85 | | | | | | |
| TOTAL | 263 | 590 | 853 | | | |

Year class criteria: 1-ocean - males less than 68 cm, females 65 cm and less;
2-ocean-males 68 cm and larger, females 65 cm and larger.

Appendix D. Fork length (cm) frequencies of spring chinook salmon, Oxbow Hatchery, 1990.

| Scale | Length | Total |
|---|---|---|
| 45 | 45 | |
| | 46 | |
| | 47 | 1 |
| | 48 | |
| | 49 | |
| 50 | 50 | |
| | 51 | 1 |
| | 52 | 1 |
| | 53 | |
| | 54 | |
| 55 | 55 | |
| | 56 | |
| | 57 | |
| | 58 | |
| | 59 | |
| 60 | 60 | |
| | 61 | |
| | 62 | |
| | 63 | |
| | 62 | |
| | 63 | |
| | 64 | |
| 65 | 65 | |
| | 66 | |
| | 67 | 1 |
| | 68 | 1 |
| | 69 | 1 |
| 70 | 70 | 2 |
| | 71 | 1 |
| | 72 | 5 |
| | 73 | 4 |
| | 74 | 5 |
| 75 | 75 | 5 |
| | 76 | 3 |
| | 77 | 6 |
| | 78 | 9 |
| | 79 | 12 |
| 80 | 80 | 4 |
| | 81 | 7 |
| | 82 | 6 |
| | 83 | 1 |
| | 84 | 3 |
| 85 | 85 | 1 |
| | 86 | 1 |
| | 87 | 1 |
| | 88 | 1 |
| | 89 | |

| One-ocean | 3 |
|---|---|
| Two-ocean | 55 |
| Three-ocean | 29 |
| TOTAL | 87 |

| SCALE | LENGTH |
|---|---|
| 90 | 90 |
| | 91 |
| | 92 |
| | 93 |
| | 94 |
| 95 | 95 |
| | 96 |
| | 97 |
| | 98 |
| | 99 |
| 100 | 100 |

TOTAL 87

Year class criteria: 1-ocean - less than 53 cm; 2-ocean - 53 cm through 79 cm; 3-ocean - 80 cm and larger.

Submitted bys

Brent R. Snider
Fish Hatchery Superintendent I

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
Bureau of Fisheries

Bill Hutchinson
Fish Hatcheries Manager